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When the Desert Gets Drier

Aaron J. Pultman
Johns Hopkins University, apultma1@jhu.edu

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For the past few decades, the world has been dealing with the consequences of climate change. This phenomenon has resulted in strange and dangerous weather effects all across the globe which have been particularly intense in regions with previously severe climates, namely the Middle East and North Africa. This region has seen its most perilous features intensify with higher temperatures and less water. It has also witnessed new challenges such as rising sea levels. These changes directly threaten current US forces and operations in the region. They also, however, threaten to destabilize region and create additional conflict in an already war-torn area. This would further stress American security with more armed conflict and an even greater refugee crisis.

I. Is Climate Change Real?

In the last half century, scientists across the globe have been observing irregularities in the weather, atmosphere and environment of our planet. In the 1950s, they began to discover warming patterns. At the same time, they noticed that the level of CO₂ (Carbon Dioxide) in the atmosphere was rising. Scientists theorized that a process known as the “greenhouse effect” explained the linkage between the two^[1]. With the rise of human production, beginning with the industrial revolution, the amount of CO₂ has increased dramatically. This excess Carbon Dioxide becomes trapped inside the earth’s atmosphere. Scientists at the National Aeronautics and Space Administration (NASA) noted that for the last four hundred thousand years, the level of Carbon Dioxide in the atmosphere had never risen above 300 (parts per million); today, the level is 420 (parts per million). Once in the air, CO₂ prevents heat from the sun from escaping the atmosphere.^[2] This, in turn, causes the planet to heat, affecting weather and climate all around the world. One of the earliest scientists to write about the issue was Columbia University Professor Wallace Broecker. In 1975, Professor Broecker publish an article entitled, “Climatic

Change: Are We on the Brink of a Pronounced Global Warming?”^[3]. In the piece, he states that, “a strong case can be made that the present cooling trend will, within a decade or so, give way to a pronounced warming induced by carbon dioxide.” He was the first to accurately predict the trend currently underway, even before more accurate data became available.

Scientists today have since confirmed Broecker’s thesis, though today the process is known as climate change. This is because the effects of the Carbon Dioxide are much farther-reaching than the warming of the planet. Not only is the average temperature on earth expected to rise, but the ice caps are diminishing, heatwaves will become more prevalent and severe, sea levels will rise and extreme weather events such as hurricanes will become more frequent.^[4] The Intergovernmental Panel on Climate Change stated that, “[s]cientific evidence for warming of the climate system is unequivocal” and that “[t]aken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time.”

Not everyone is convinced of the existence of human induced climate change. The climate change deniers believe that the evidence is insufficient and that climate change is a hoax. This view, however, is primarily prevalent in the lay community; scientists almost unanimously agree on the existence of climate change. Large scientific institutions have all discovered similar evidence pointing to climate change. NASA, the Hadley Center, the National Oceanic and Atmospheric Administration and the Japanese Meteorological Agency have all observed a similar rise in global temperatures.^[5] Major scientific societies have also expressed their belief in the existence of climate change. Almost two hundred societies worldwide have released statements endorsing climate change including the American Association for the Advancement of Science, the American Chemical Society, the American Physical Society, the American

Meteorological Society, and the U.S. National Academy of Sciences, to name a few.^[6] Finally, independent scientists have also demonstrated overwhelming support of the theory. Numerous studies have concluded that over 90% of scientists believe in climate change.^{[7][8]} Consequently, while there are some who deny the existence of climate change, this paper will treat the issue consistent with the overwhelming majority of the scientific community: as a fact.

II. Effects of Climate Change

The effects of climate change are most apparent in regions which already suffered from severe weather patterns. This applies in particular to the Middle East and North Africa (MENA). This region has always been one of the hottest and driest places on earth. Throughout history, people in that region have had to contend with extreme weather. Climate change, however, has drastically exacerbated the problem. Its effects pose numerous threats to the future of MENA countries and their citizens.

A. Water Scarcity

The first major threat to the region is the lack of water. Water has always been an extremely precious resource in the region. Possession of water has created conflicts between groups for millennia. This was all true before climate change began to take effect. Currently, water stress has grown tremendously and will only continue to get worse. MENA countries represent 6% of the world population but have less than 1% of global water supplies.^[9] The Water Project describes the Middle East as being in a “water crisis”.^[10] This is a situation which is not going to get better in the near future. The World Resources Institute listed the top 33 countries it projected to be the most water stressed by the year 2040. Of the list, 22 are MENA nations.^[11] Furthermore, two NASA satellites were able to observe major freshwater losses

across the Middle East.^[12] This, coupled with diminishing rainfall, indicates that MENA nations are headed for water disaster.^[13]

This threat is made worse by population trends in the region. According to the Population Reference Bureau, the population of MENA increased from 100 million in 1950 to 380 million in 2000 -- a 3.8 times increase.^[14] This trend is expected to continue, potentially doubling the population of MENA by 2050. This poses serious challenges to the region, most notably with regard to water.^[15] There is already not enough water for the current population let alone an increased one. Overall water demand is expected to rise 50% by 2025 in 13 Arab countries. It has been proposed that urbanization will slow the birthrate. While this may be true, urbanites consume considerably more water than their rural counterparts and thus the problem would remain unchanged.

Compounding these problems is the issue of water mismanagement. Many MENA countries use water extremely inefficiently. Irrigation systems in the region often waste a tremendous amount of water which they cannot afford. 87% of water in the region goes to irrigation.^[16] Jordan, for example, is the same size as Portugal but it only has less than 10% of the water withdrawal. Yet it expends a tremendous amount of freshwater on agriculture. The United Arab Emirates boasts one of the highest per capita rates of water consumption in the world despite the fact that it is under severe water stress. If its practices are not changed, the UAE is projected to run out of freshwater completely in approximately fifty years. Continuing mismanagement of water would ensure disaster for the region.

There have been numerous proposed solutions to the problem of water stress. Most countries immediately turn to their groundwater supply in times of need. Groundwater is, “the water found underground in the cracks and spaces in soil, sand and rock. It is stored in and

moves slowly through geologic formations of soil, sand and rocks”.^[17] It is extremely useful for times of drought or increasing agriculture. Tapping into groundwater too often, however, is a very dangerous practice. “Groundwater is like your savings account,” says Dr. Matthew Rodell of NASA, “It’s okay to draw it down when you need it, but if it’s not replenished, eventually it will be gone.”^[18] For example, during a drought in 2007, thousands of wells were dug in Iraq which has resulted in major depletion of its groundwater reserves. This is the case all across the region. Saudi Arabia has used close to two thirds of its groundwater, the UAE’s groundwater reserves are falling by about a meter per year and Yemen’s are falling by six meters per year. According to the World Bank, between 1998 and 2002, MENA used close to 80% of available groundwater -- more than double the next closest region.^[19]

Groundwater usage poses additional hazards as it is also extremely vulnerable to contamination. Fertilizers, chemicals, pollution and sewage all threaten the viability and safety of groundwater which can affect existing sources of water. The Jordan River is currently being depleted by contamination farther upstream by Israel and Syria. Unless governments in the region take better care of their groundwater reserves, they are likely to disappear. Some states, such as Saudi Arabia, have attempted to improve in this area,^[20] but so far these efforts have not led to any serious, lasting reforms.

Another solution which has been suggested is employing desalination. Desalination is the process of removing salt content from sea water to make previously undrinkable water viable for use in agriculture as well as drinking water. Currently, up to half of the municipal water in MENA countries is supplied by desalination. Approximately 76% of worldwide desalination takes place in MENA.^[21] The main centers are Saudi Arabia, Kuwait, the UAE, Qatar, Bahrain, Libya and Algeria. Desalination, however, is a highly-resource intensive process and is

extremely expensive. Many MENA nations are underdeveloped and do not have the means to operate desalination plants on a massive scale. Thus, desalination cannot even be considered by nations such as Yemen, Iraq and Syria. Furthermore, even in countries with large desalination infrastructure, the process can only produce a small percentage of the water required. Even wealthier nations like Saudi Arabia and Israel are incapable of producing enough water to replace what is being used. Consequently, while desalination is an attractive sounding option, it is not a substantial solution to the water crisis in MENA.

B. Heat

The second major threat from climate change is extreme rises in heat. This is one of the primary effects of climate change which can be felt all over the globe. From 2015 to 2016, the planet experienced 11 record hot months in a row.^[22] While this alone is significant, what scientists paid attention to was how high above average each month was. The months were 1.2 degrees Celsius above the average temperature. Additionally, 2015 marked the biggest year-to-year jump in Carbon Dioxide in the atmosphere and was a record low year for the Arctic sea ice peak. These warming trends particularly affect MENA countries. The summer of 2016 brought record temperatures throughout the region. Mitribah, Kuwait and Basra, Iraq both reached a temperature of 129 degrees Fahrenheit.^[23] Soon after, Fujairah in the United Arab Emirates had a heat index of over 140 degrees Fahrenheit. These readings are indicative of the rising temperatures that MENA nations will have to contend with.

Rising heat will pose a serious threat to the safety of the people in MENA countries. In particular, the temperature in summer in the region is expected to rise dramatically. It is projected that by the end of the century there will be an average temperature rise of approximately five degrees Celsius.^[24] Heatwaves are also expected to last much longer than in

the past. By the end of the century, heatwaves which typically average 16 days will extend to between 80 and 120 days. During these heatwaves, the days will average over 120 degrees Fahrenheit and the nights will never drop below 85 degrees. Heatwaves will also occur much more frequently: up to ten times as often. This means that for large portions of the year people will not be able to spend extended periods of time outdoors. Those who do go outdoors or do not have the money to afford cool conditions will risk rapid dehydration, illness and even death.

Another consequence of the rise in temperature is that the region will become even drier than it already is. As the heat increases, precipitation in the region will fall. By the middle of the century rainfall in the region is predicted to drop between 30% and 70%. This will have devastating effects on life in MENA nations. Furthermore, this problem only compounds. The less rainfall there is each year, the less water will evaporate and fall the following year. In the last few decades, the precipitation levels of Jordan and Syria have rapidly diminished.

The result of all of this is the possibility that heat will make the region uninhabitable in the not-so-distant future. Multiple studies have concluded that the temperature in MENA will exceed human adaptability.^[25] They conclude that humans will be unable to survive in such an extreme climate. A study from the German Max Planck Society for the Advancement of Science brought up the possibility of a “climate exodus” from the region.^[26] This would create a tremendous refugee crisis dwarfing the current one.

C. Sea Level Rise

The third major threat facing MENA is rising sea levels. In recent years, sea levels on earth have risen by several meters. This is primarily due to melting of the polar ice caps.^[27] By the end of the century, sea levels are projected to rise between one and five meters. This will pose several massive threats to Middle East and North Africa. These nations have coastlines on

the Mediterranean Sea, the Red Sea, the Arabian Gulf and the Atlantic Ocean. It is projected that even a single meter rise in sea levels would impact 41,500 Km² of Arab nations, an area comprised of approximately 37 million people.^[28] That is the most conservative estimate of what is to come. Other climate scientists project that the devastation will be much larger in scale. According to the extreme projections, coastal nations such as Bahrain, Qatar, and the UAE could each have half of their populations affected.

The effects of sea level rise go beyond simple inundation with water. A rise in salinity would also pose serious danger to MENA nations.^[29] As the sea rises, salt content will enter the country. This endangers groundwater reserves, can alter the salt content in soil and impact agricultural productivity. It also threatens biodiversity in the region. The coral reefs off the coast of Egypt, for example, are home to numerous aquatic species that would be threatened by rising sea levels. Furthermore, it would also threaten numerous economic hubs near the coasts. Sea level rise would also have the secondary effects relating to the costs inherent in relocating and employing people forced out of their homes by rising sea levels.

Several MENA nations provide effective case studies for the possible damage caused by the prospect of rising sea levels. The first is Egypt. Egypt is host to approximately 3,500 Km of coastline along the Mediterranean and Red Seas. A tremendous amount of economic activity and tourism takes place near the coast. Several highly populated cities -- Alexandria, Rosetta, Damietta, Port Said, Suez and Hurghada -- are all located close to the coastline. A good deal of commerce takes place on the coast in the form of profitable harbors and fishing. Egypt's coasts, however, are considered especially vulnerable to sea level rise. In particular, the Nile Delta is identified as the most at-risk area. The Delta is a relatively low-lying area uniquely exposed to this threat. It also happens to be a critical region for the country. One third of the Egyptian

population lives there, half of all of the country's crops are produced there and it is home to numerous commercial and industrial centers. A 2004 study concluded that, "the Nile Delta coastal zone is highly vulnerable to the impacts of sea level rise through direct inundation and salt water intrusion." Furthermore, the soft soil of the Delta area makes it susceptible to erosion from the tide. Every year, more and more of its coast washes away. It is also clear that the salt content of the seas has begun to seep into the groundwater and contaminate it. This will lead to diminishing amount and quality of crops and a deterioration of health and tourism. Additionally, according to a study, due to sea level rise, "[t]he increase of intensity and frequency of extreme events is also expected to affect the coastal zones of Egypt and extend over the whole country." These events include dust storms, heat waves and other major storms.

Another useful case to consider is the Kingdom of Saudi Arabia. Saudi Arabia has coastlines on two of its borders. To the west, it has a coast with the Red Sea which stretches for 1,760 Kilometers; to the east, its coast with the Arabian Gulf covers 650 Kilometers. Along these coastlines are large coral reefs and mangrove patches which make up the ecosystem. Recently, more cities have begun to emerge near the coasts, putting them in danger from sea level rise. Four cities, Jeddah, Rabigh, Yanbu and Gizan, have been identified as especially vulnerable while four more, El Khafji, Al Jobail, Al Dhahran and El Khobar, are in dangerous areas as well. A study conducted in 2005 concluded that, "[a]n increase in sea level rise will increase intrusion of saline water from both the Arabian Gulf and the Red Sea into coastal aquifers, which will potentially affect the freshwater supply" and that "[i]n cases of flooding in coastal areas, salt water will further intrude into aquifers."^[30] Furthermore, sea level rise would seriously threaten what little groundwater remains in Saudi Arabia. Rising sea levels would also threaten the agricultural production near the coasts. Two coastal, agricultural cities, Sehat and Qateef, have

already discovered elevated salt content in their soil which has affected their production abilities. Saudi Arabia is also in danger of losing many of its coastal beaches from erosion. While this may not sound like a serious issue, without the beaches for protection, buildings near the coast will be exposed to damage from the sea and will deteriorate without expensive and resource intensive defenses. “A sizable proportion of the Arabian Gulf and Red Sea will be affected to a combination of inundation and erosion, with consequent loss of developed properties including industrial, recreational and residential areas.”^[31]

III. Climate Change and Agriculture

A theme that emerges from the study of climate change is the threat it will pose to agriculture in the region. Agriculture is a staple of life in the MENA region. As is, local agriculture is not quite sufficient to meet the needs of MENA countries and a tremendous amount of food already has to be imported. This causes a good deal of strain on the economies of the region. To minimize this issue, local agriculture is considered a critical element of society in MENA nations. To protect itself from exploitation from exporters of produce, domestic agriculture needs to remain strong.^[32] Not only does local agriculture provide a significant amount of food to the citizens of these nations, it is also a major source of employment in MENA countries. The agrarian sector represents 28% of employment in Egypt, 44% in Morocco, 50% in Yemen, and 40% for the entire region.^[33] “The agricultural sector is generally viewed as the driving force for the development of the MENA region, especially in non-oil producing countries.” Agriculture is especially important for rural residents of these countries. It is the source of livelihood for approximately 70% of rural people. Yet agriculture in MENA nations still does not provide adequate food security. “In many countries, average per capita caloric intake is below minimal nutrition standards. Several countries are currently experiencing severe

food shortages, and the food shortage problem is expected to increase during the next decade.”

Local growers cannot supply their countries’ needs and leave the nations at the mercy of imported goods. These problems are currently being exacerbated by the rapidly expanding populations of these countries. Food supply has either declined or remained stagnant while the number of people to feed is constantly growing.

This was all true before being complicated by climate change. Currently, the effects of global climate change have had and will have extremely negative effects on agriculture in the MENA region. The climate is incredibly impactful when it comes to agriculture. As the Environmental Protection Agency has stated: “Overall, climate change could make it more difficult to grow crops, raise animals, and catch fish in the same ways and same places as we have done in the past.”^[34] Effects to temperature, salinity, biodiversity and water will all play a role going forward in the future of agriculture. All of these changes are likely to have adverse impacts on agriculture. Water, in particular, is going to pose numerous problems with agriculture. Currently, agriculture consumes 89% of MENA’s scarce and diminishing water resources. “Fresh water supplies are already fully used, 80% of which are currently used in agriculture, and escalating demands for industrial, urban, and environmental uses will reduce the water available to agriculture.”^[35] This is an unsupportable model and major changes will need to be made as climate change takes an even heavier toll on water supplies. Additionally, since much of the food in the MENA region is imported, it will be heavily impacted by climate change in other parts of the world. As MENA nations struggle with the effects of climate change, other countries will be doing the same. Countries like the United States, which supplies a quarter of the world’s produce, will also be affected. In the US, “[p]roduction of all commodities will be vulnerable to direct impacts (from changes in crop and livestock development and yield due to

changing climate conditions and extreme weather events) and indirect impacts (through increasing pressures from pests and pathogens that will benefit from a changing climate).”^[36] Thus, this global issue will have a direct and devastating impact on the MENA region. “It will alter the stability of food supplies and create new food security challenges for the United States as the world seeks to feed nine billion people by 2050.”^[37]

While the issues presented already pose numerous direct threats to MENA nations, there are also numerous secondary effects caused by climate change. As mentioned above, agriculture represents 40% of employment in the region. If the industry suffers, rampant unemployment is sure to follow. Unemployment is already a major problem in the region. Per the World Bank, unemployment, and in particular youth unemployment, is extremely high in MENA nations.^[38] The unemployment rate for young men is 22% and 39% for young women. Yemen has an overall 40% youth unemployment and some estimates put Iran’s as high as 50%. This is made even worse by the fact that populations in the region are rapidly expanding. As the population rises, employment needs to rise with it to develop strong economic activity. Unfortunately, however, the opposite is occurring. Not only are employment opportunities not being created, but agriculture-related job opportunities will likely be lost as a result of climate change.

IV. Security Implications of Climate Change

A. Climate Change, Ineffective Governments and Civil Unrest

Exacerbating all of these issues is the lack of effective governance in the region. The governments in the MENA region are almost entirely autocracies rife with corruption and inefficiency or failed states with little to no government whatsoever. This makes dealing with climate change incredibly challenging. Effective climate policy often involves making tough decisions that may anger special interests and people close to the ruling government. This is

often true when it comes to managing resources such as groundwater. Lack of water availability means that the government must choose who will get access to those resources, often a tradeoff between urban and rural communities. Urban citizens use more water per capita but rural residents need water to cultivate their farms. Typically, friends of the ruling family and other members of the upper class live in large cities and use their connections to divert resources away from rural areas. This creates tremendous friction between citizens.

A good example of this dynamic is demonstrated by the Azraq Oasis in Jordan. For all of recorded history, the Azraq Oasis has been a major congregating point for travelers and a hub of animal life. In the early 1980s, however, the government of Jordan began to pump out water from the Oasis and funneled most of it to Amman.^[39] Less than two decades later, the Oasis was almost entirely empty. The birds who flocked to it left for the Sea of Galilee and the water buffalos died. This action greatly angered the local rural populations. Hundreds of farms had been sustained with water from Azraq and their production suffered enormously from the lack of a stable water source. Additionally, tapping the Oasis lowered the area's water table leading to an increase in salinity in the soil. This too has had a negative impact rural farmers. The lack of springs has also allowed numerous wildfires to spring up in the now-dry environment. The decisions about the Azraq Oasis have sparked intense feelings of resentment among the rural communities towards the urban population, and especially towards the government.

The resentment and anger caused by problems with governments in the MENA countries can have serious consequences for the stability of the region. Angry citizens packed into cities can overthrow governments under the right circumstances. While the effects of climate change are never the entire cause for coups they are often contributing factors. This is evident in the origins of the current Syrian crisis. Most people think of the Syrian Civil War as beginning with

protests again the government in 2011. This analysis overlooks the impact of a major drought that Syria underwent between 2007 and 2010. A study in the National Academy of Sciences concluded, “that human influences on the climate system are implicated in the current Syrian conflict.”^[40] The drought lasted longer and was more intense than would have happened without the effects of climate change. This drought destroyed agriculture in Syria and displaced thousands. These people then flocked to major cities looking for shelter and employment. The Assad government, however, was incapable of properly addressing the needs of its people. Consequently, they took to the streets in protest. While uprisings are never caused by a single factor, in this case, climate change absolutely played a significant role. A displaced Syrian farmer said in an interview: “Of course. The drought and unemployment were important in pushing people toward revolution. When the drought happened, we could handle it for two years, and then we said, ‘It’s enough.’”^[41]

It is also possible to observe the political implications of climate change in Egypt. Like Syria, Egypt underwent political turmoil in 2011. Unlike Syria, however, the precipitating climate event did not take place in the Middle East but rather a drought in Eastern China. The United States Department of Agriculture released a Commodity Intelligence Report on the 2010 drought in China.^[42] The report identified climate change as the cause of the drought and its impact on that year’s wheat crop. While wheat in China may not seem relevant to MENA, Egypt is the world’s number one importer of bread and a large source of its wheat is China.^[43] Without the necessary wheat, the price of bread in Egypt tripled. Studies have linked this to the unrest which led to the 2011 coup in Egypt. They establish “direct and indirect links between natural hazards, food security and political stability at local and global scales” and that the, “influence of climate events and disasters have a global reach.”^[44]

The 2011 coup in Egypt starkly illustrates one of the most dangerous elements of climate change: that events in one country can severely impact another region entirely. The MENA region is particularly susceptible to this dynamic as it is not self-sufficient when it comes to food and water supplies. Without major systemic changes, MENA countries will continue to be vulnerable to this threat

B. Increased Risks of War

Climate change in the MENA regions brings a different threat as well: interstate conflict. The Middle East and North Africa are areas well versed in conflict between nations. Now, however, with the advance of climate change, there are more reasons to fight. Water, in particular, has caused and will cause more tensions and hostilities between states. According to Foreign Policy Journal: “Increasing scarcity and dire projections have made states view water both as a national security priority and as a political and economic lever. In this region, water, like oil, cannot be separated from politics.”^[45]

The main conflicts based on water are centered on downstream versus upstream nations. Upstream nations have a disproportionate control over water supplies from rivers which are a major source of water in the region. Turkey, for example, is an upstream state on both the Tigris and the Euphrates, vesting in it the control of major regional water sources. Turkey has used its upstream position to build dams and preserve more water for itself. Turkey has two new dams, the Ilisu and the Cizre, on the Tigris River and the Ataturk Dam on the Euphrates. This limits water access to downriver states such as Syria and Iraq. While Turkey has a treaty with Syria over water, it has no such deal with Iraq. Instead, the government of Turkey decided to act unilaterally, escalating tensions with Iraq. Indeed, other downstream states, like Egypt, have threatened war to protect their scarce water resources.

The Islamic State(IS), on the other hand, has made seizing water sources a major part of its strategy in establishing its caliphate. It views the capture and control of dams on the Tigris and Euphrates as critical strategic aims in its effort to control the territories of Iraq and Syria. IS captured the Tabqa Dam in Syria in 2014 and has tried repeatedly to seize the Mosul and Haditha Dams, the largest ones in Iraq. Water also plays a large role in existing conflicts such as the Israeli-Palestinian conflict where water sources in the West Bank are hotly contested. All in all, the effects of climate change on resources like water will continue to ratchet up tensions in the MENA region.

C. Defense of Threatened Allies

Heightened tensions are not purely restricted to the region; they also affect the United States and its security. As discussed, climate change is likely to create additional conflict and instability in the MENA region. More war will continue to break out threatening American allies, interests, and security. The United States has numerous allies in the region who may become involved in these conflicts.

The first ally in potential danger is Israel. While Israel has been threatened since its creation, climate change only heightens that danger. Israel is a regional leader in water conservation and renewable energy sources. As climate change further affects the region, Israel will either be a target for cooperation or for attack.

Turkey is another ally of the US susceptible to conflict due to climate change. The Turkish government has been a critical actor when it comes to climate conflict in the Middle East. As mentioned above, Turkey has been very active in dam construction at the expense of other downstream nations. If this continues, Turkey may find itself under attack by its neighbors. This is significant because Turkey is a member of the North Atlantic Treaty

Organization (NATO) along with the US. The NATO charter demands that an attack on one member be treated like an attack on all members.^[46] Consequently, if Turkey were to be attacked, the United States would be obligated to respond with force.

Other American interests are also at stake. Additional conflict would threaten current US forces and citizens located in the region. As heat increases, US military operations will be drastically restricted. Troop movements and activities will have to be cut down dramatically during the summer months. Furthermore, America remains a favorite target for extremists from the region and further instability would only exacerbate that problem. In the last few years, instability in countries such as Iraq and Afghanistan has led to entities like Al Qaeda, the Taliban and the Islamic State seizing power. Yemen, a MENA country beset by numerous climate-related problems and without a functioning government, is a hotbed of civil unrest and an incubator for multiple jihadist groups. As more and more countries in the region become failed states due to political instability, local extremist groups will have more freedom to operate against the United States and its allies.

American economic interests would also be threatened by climate change related instability. The US does a good deal of trade with MENA countries. In 2008, the US had \$215 billion worth of trade with MENA nations.^[47] If the political situation in the region deteriorates these American investments could be lost.

Finally, perhaps the biggest threat to the US would be a climate exodus from the MENA region. Hundreds of millions of people currently reside in the Middle East and North Africa. As discussed above, some scientists predict that the region will become uninhabitable by the middle of the century. This would create a refugee crisis that would dwarf the one currently underway. Desperate refugees would inundate wealthier nations in Europe and North America. Already,

countries are balking at the idea of providing a safe haven for refugees purely from Syria; eventually, there would be too many refugees to deny. The influx of millions of MENA refugees would overwhelm Western nations, putting tremendous strain on their services, economies and security.^[48] This would be a tremendous risk to the United States and is a scenario which it will have to work to avoid.

Conclusions:

The threats posed by global climate are far reaching and potentially devastating. Threats such as increased temperatures, sea level rise, and water scarcity will endanger the people of the MENA region. Unless drastic action is taken, the security of MENA nations and the United States will be at stake. If climate change goes unchecked, political instability and violence are sure to beset the region. This will threaten US allies, citizens and interests in the region as well as at home. It would also create a refugee crisis the likes of which the world has never seen. This situation demands action from the nations of the region. If they do not act to mitigate the threats, any attempted solutions will fall short. The primary impediment to this, however, is the nature of governance in the region. The governments of MENA countries are, for the most part, either autocracies or failed states. Each of these comes with different challenges to climate policy. Autocracies are prone to corruption and mismanagement. They are not likely to make tough and smart choices for energy consumption and water usage. Failed states, on the other hand, have no ability to regulate resources and enact any sort of climate initiatives. Consequently, major governmental reforms will be necessary to address the threats. Autocratic leaders will need to make smarter decisions and factions in failed states need to begin cooperating. This will require outside help as well. Foreign governments, especially the United States, will need to assist with the situation. Non-governmental entities such as corporations and non-profits will also be instrumental in addressing these problems. If drastic steps are not taken, however, the MENA region and the world will suffer the consequences.

Endnotes:

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